2(b)
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PARSONS ENGINEERING SCIENCE, INC.

19101 Villaview Road, Suite 301 • Cleveland, Ohio 44119 • (216)486-9005 • Fax:(216)486-6119

DATE: 2/11/98

TO: KEITH HOUSEKNECHT
LOCATION: CANTON DROP FORGE
RAPIDFAX NO.: 330-477-2046
COPIES TO:

FROM: ED KARKALIK

TOTAL NUMBER OF PAGES 1 (including this cover letter)

IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL BACK AS SOON AS POSSIBLE.

We are herewith transmitting the following:

DATE	NO.	DESCRIPTION

KEITH -

ACCORDING TO "AS-BUILT" SURVEY COMPLETED BY BEAVER ON 1/8/98, THE ELEVATIONS ARE:

TOP OF PUMP PAD 1067.91
TOP OF PUMP SUCTION 1069.79 @ PUMP
TOP OF SUCTION INLET 1056.67 @ SUMP

WHEN THE TURN-DOWN NOZZLE & SCREEN ARE INSTALLED ON SUCTION INLET, FINAL ELEVATION (TOP OF PIPE) WILL BE APPROX. 1055.67

-ED

JOB NO. 73139.07000

02000002

CDF000857

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Argo Industrial

Division of Argo International Corporation

9001 Dutton Drive, P.O. Box 407
Twinsburg, Ohio 44087-0407

TELEPHONE: (216) 425-3121
FAX: (216) 425-4612

Canton Drop Forge
4575 Southway S.W.
Canton, Ohio 44076

Attention: Keith Houseknecht
Reference: Gorman Rupp Self Priming Pump

Dear Keith,
At pumps driven speed, a suction lift of up to 21 feet (vertical) is possible. A vacuum test showed pump is working as designed, and priming problems are related to suction line. We use a safety factor of 2 feet when sizing pumps, so 19 feet at driven speed should be a good number. The horizontal run on the suction line also cuts down on some of the pump efficiency. But still, it is working as designed.

Your initial problems at start up came from the air leak on the suction line (at the valve) and, not allowing air to escape from pump case (bypass valve) changing motors and pump speed will not speed prime time, and Gorman Rupp assures us that anywhere under 5 minutes is normal for priming at that speed.

These are the same guidelines we established in early January, and they still apply.

Let me know if you need further assistance.

Sincerely,

Gary Haberny,
Industrial Sales Rep
Argo International Corporation

CC: Frank Sevedra Argo, International Credit
CC: John Zgela, Gorman Rupp
CC: Sam Sadd, Parsons Eng.
CC: Ed Kecourek, Parsons Eng.

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Argo Industrial

Division of Argo International Corporation

9001 Dutton Drive, P.O. Box 407
Twinsburg, Ohio 44087-0407

TELEPHONE: (216) 425-3121
FAX: (216) 425-4612

Canton Drop Forge
4575 Southway S. W.
Canton, Ohio 44706

Attention: Keith Houseknecht

Reference: Gorman Rupp Self Priming Pump

The following steps are recommended for your Gorman Rupp Self-Priming Pump.
To insure priming in under 5 minutes, at a prime lift of 16 feet:

Step 1. Valve on suction line needs to be removed and a blanking flange installed. This valve had allowed a vacuum leak, which was causing the pump to slow prime.

Step 2. A bypass line of small diameter needs to be installed to allow air to be released between pump case and discharge checkvalve. The Installation and Maintenance manual spells this out in the installation section.

Step 3. A strainer needs to be installed on suction line to insure that pump suction will not be blocked by floating debris in the pond.

Step 4. Float switch needs to be installed and tethered to assure pump will not run dry or cause a vortex.

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CANTON DROP FORGE

TELECOPIER COVER SHEET

PLEASE DELIVER THE FOLLOWING PAGES TO:

NAME: Ed Karkalik

FIRM: Parsons Engineering

CITY:

PHONE: ( ) FAX: ( )

FROM:

NAME: Keith Housekneckt

FIRM: CANTON DROP FORGE

CITY: Canton, OH

TOTAL NUMBER OF PAGES 3 INCLUDING COVER SHEET.

WE ARE TRANSMITTING ON THE FOLLOWING:

DATE: 8/25/98

TIME: 11:15

IF YOU DO NOT RECEIVE ALL PAGES - PLEASE CALL BACK AS SOON AS POSSIBLE.

TELEPHONE: (330) 477-4511, EXT. 188

2 Area Letters

CDF000860

4575 Southway Street S.W. • P.O. Box 6902 • Canton, Ohio 44706-0902 • (330) 477-4511 • FAX (330) 477-2046

PARSONS ENGINEERING SCIENCE, INC.
A UNIT OF PARSONS INFRASTRUCTURE & TECHNOLOGY GROUP INC

19101 Villaview Road, Suite 301 • Cleveland, Ohio 44119 • (216) 486-9005 • Fax (216) 486-6119
PARESCL/398Dee/EJK8-4

2(6)
3

4 March 1998

Mr. Keith Houseknecht
CANTON DROP FORGE, INC.
4575 Southway Street, SW
Canton, Ohio 44706

Reference: Lagoon No. 1 Reconstruction Project; Outstanding Pump Installation Items and Other Project Activities

Dear Keith:

In accordance with our recent discussions regarding the completion of outstanding issues concerning the Lagoon No. 1 Reconstruction Project, especially pertaining to the identified pump installation items, and two other activities not related to the Lagoon No. 1 project, Parsons Engineering Science, Inc. (Parsons ES) submits the following information for your review and approval.

Lagoon No. 1 Reconstruction Project

As we have discussed, I have revised and attached a listing of pump installation items, which has been modified from that originally forwarded to you on 18 February 1998 by facsimile. In particular, this revised listing reflects your instructions to delete the proposed item for upgrading the pump motor (from 5 to 7.5 HP) and associated engineering and construction observation activities. Please refer to Parsons ES' facsimile dated 8 August 1997, which provides a description of the original scope of the pump installation. The remaining engineering and construction observation costs pertain to the incremental activities included in Schedules B and C; although there is no or little incremental costs being charged to Canton Drop Forge, Inc. (CDF) for many of the items listed in Schedules B and C, there are (or have been) additional engineering and/or construction management expenses incurred by Parsons ES to secure the completion of these items.

As we have discussed several times previously (including during project inception last Summer), CDF (on Parsons ES' suggestion) has contracted for our services on an engineering and construction observation, not turn-key project management, basis. The implications of this difference are evident in both the scope of services for which we have been contracted (and, hence, should be held accountable) and our price. As indicated both initially and in our most recent discussion, if this project had been contracted on a turn-key basis, we would have provided overall project management, general contracting (i.e., all materials, equipment and services would have been subcontracted through Parsons ES) and full-time construction management services. Obviously, the costs for these additional services, as predicted last Summer, would have been substantially (at least $25,000 for general contracting and construction management alone) higher.

If the proposed arrangement, as presented in the attachment, is acceptable to CDF, supplemental purchase orders should be issued to Beaver Excavating Company (Beaver) for $1,143 (for Item Nos. 9, 13 and 14 of the accompanying table) and to Parsons ES for $2,048 (for Item Nos. 12, 16 and 17) to address the outstanding pump installation items. Parsons ES and Beaver have agreed to absorb the remaining costs (from Schedule A and Item No. 8 of Schedule B totaling $2,947) to address the other pump items listed.

Proposed ODOT Sewer Installation Project

As requested by CDF, Parsons ES prepared for and participated in two meetings at Canton Drop Forge's offices to discuss the pending Ohio Department of Transportation (ODOT) sewer project. Additionally, Parsons ES visited the Stark County Recorder's offices to obtain official copies of the deeds and easements for the parcel which would be impacted by the proposed ODOT project. CDF has been given copies of these documents. The costs for these incremental services totals $766, including labor and ODCs (mileage, Recorder copies, etc.).

Due Diligence for CDF Re-Organization

As requested by CDF, Parsons ES has participated in four telephone conversations with Mr. Houseknecht and Ms. Amy Wachs to provide due diligence information to the financiers funding the then-proposed re-structuring of CDF. The effort has required 4.5 hours of labor plus ODCs (including telephone and facsimile charges), totaling $544.

In summary, to finalize the pump installation items identified in the attachment as well as the other two service activities performed for CDF, we request that you authorize the following additional funding:

	Beaver	Parsons ES
Lagoon No. 1 Pump	$1,143	$2,048
ODOT Sewer	- 0 -	$ 766
CDF Re-Organization	- 0 -	$ 544
	$1,143	$3,358

Your prompt consideration of these items will be appreciated. As always, Parsons ES looks forward to continuing to provide environmental services to Canton Drop Forge. If you have any questions regarding this transmittal, please contact Ed Karkalik at (216) 486-9005.

Very truly yours,

PARSONS ENGINEERING SCIENCE, INC.

Wilson H. Rownd, PE
Vice President/Manager

Edward J. Karkalik, PE
Project Manager

WHR/EJK/dee
cc: CMB (File 731397.03000)

SCOPE OF ACTIVITIES
CANTON DROP FORGE, INC.
LAGOON NO. 1 RECONSTRUCTION PROJECT
PUMP INSTALLATION ITEMS

Following is a listing of items identified as remaining to complete the pump installation for the Lagoon No. 1 reconstruction project at Canton Drop Forge, Inc. These items are divided into categories, depending on the contractual obligations in place at the time of pump system start-up:

Item/Description	*Action Required*	*Cost Estimate*
SCHEDULE A: Under contract, but not completed		
1. Replace concentric with eccentric pump suction	Remove off-spec reducer reducer on and replace with proper piece	$81
2. Realign bypass valve on suction line	Unbolt, re-position valve	$322
3. Realign horizontal suction line section	Cut pipe and pipe support, weld in new section at slope, as indicated	$644*
4. Install 1/2" discharge bleed line	Run line along suction line to a point about 10 ft down; tie into area drain	$100
5. Complete engineering for existing scope items	As required	N/C
6. Replace/repair broken thermostat housing on motor	As required	N/C
7. Paint exposed sections of piping	As required, per spec	N/C
SCHEDULE B: Approved by CDF, but not priced or included in contract		
8. Install float switch	Drive angle iron into pond near end of suction line and attach float switch	N/C
9. Install suction nozzle and screen	Install 90 ° bend at end of suction with by 2-1/2" screen attached	$108
10. Re-install heat trace on valve bodies	After checking on revised operation, heat trace not required; remove temporary trace	$0
11. Install insulation on valve bodies	Insulation not required	$0
12. Complete construction observation on existing scope items	As required; scope of services and budget had expired	$1,419
13. Install blind flange in suction bypass valve line	When repositioning valve, install blind flange/pancake in line to prevent leaks	$27
14. Install bypass valves	Completed; see item #2 above	$1,008
SCHEDULE C: Proposed to/by CDF, but not approved or under contract		
15. Remove flapper valve from pump	Procedure to be obtained from G/R	$0
16. Complete engineering for new items	As required	$341
17. Complete construction observation for new items	As required	$288

N/C = no change in scope or no cost increase for the change.
C/O = change order from original scope, issued and approved 8/22/97.
* = costs for this item split 50/50 by Beaver and Parsons ES.

PUMP INSTALLATION ITEMS

Breakdown by Responsibility (Proposed)

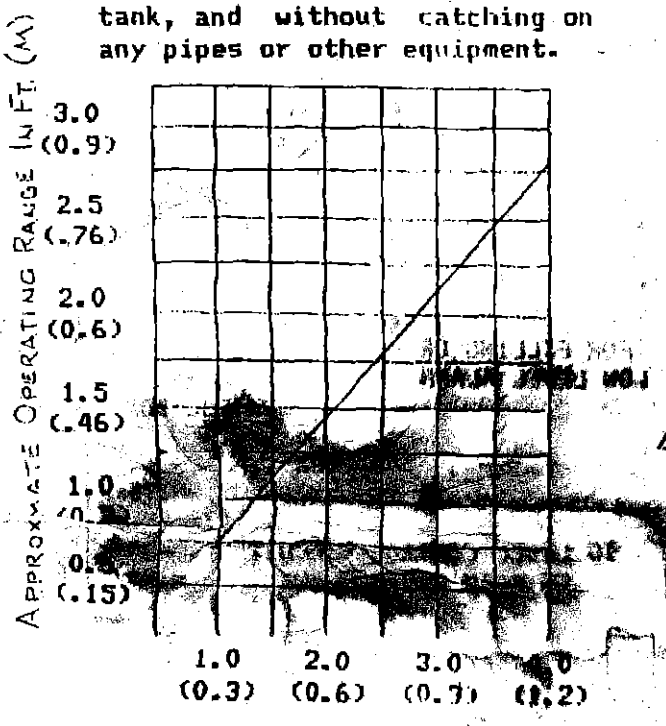
Item/Description	*Action By:*	*Cost Paid By:*	*Cost Est.:*
SCHEDULE A: Under contract, but not completed			
1. Eccentric reducer on pump suction	Beaver	Beaver	$81
2. Bypass valve on suction line	Beaver	Parsons	$322
3. Horizontal suction line	Beaver	Beaver/Parsons	$644*
4. Discharge bleed line	Parsons	Parsons	$100
5. Engineering for existing scope items	Parsons	Parsons	N/C
6. Thermostat housing repair	Beaver	Beaver	N/C
7. Painting	Beaver	Beaver	N/C
SCHEDULE B: Approved by CDF, but not priced or included in contract			
8. Float switch	Beaver	CDF (C/O)	N/C
9. Suction nozzle/screen	Beaver	CDF (C/O)	$108
10. Heat trace	Deleted	Deleted	$0
11. Insulation	Deleted	Deleted	$0
12. Construction observation/existing scope	Parsons	CDF (C/O)	$1,419
13. Blind flange in suction bypass	Beaver	CDF (C/O)	$27
14. Pump bypass valves (completed)	Beaver	CDF (C/O)	$1,008
SCHEDULE C: Proposed to/by CDF, but not approved or under contract			
15. Flapper valve removal	Beaver	CDF (C/O)	$0
16. Engineering for new items	Parsons	CDF (C/O)	$341
17. Construction observation/new items	Parsons	CDF (C/O)	$288

N/C = no change in scope or no cost increase for the change.
C/O = change order from original scope, issued and approved 8/22/97.
* = costs for this item split 50/50 by Beaver and Parsons ES.

attachment (tether length) in the sump tank determines both the on and off points and the operating range between them. Anchor the cord to a pipe or support in the sump, or the pump or housing (see Figure 1). Note the following:

a. The longer the distance between the float switch and the cord anchor point, the wider the operating range between the on and off points (see Table 1).

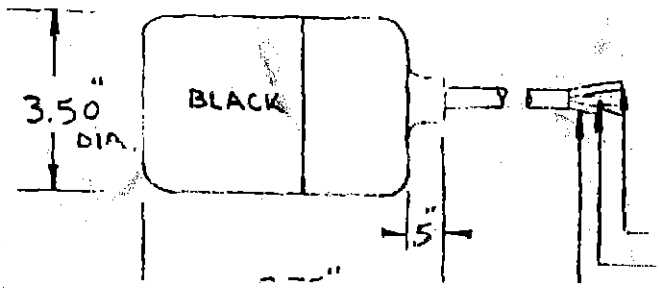
b. The float switch must be able to rise and fall without rubbing the sides of the sump or tank, and without catching on any pipes or other equipment.



APPROXIMATE FREE CORD LENGTH IN FT.(M)

Table 1. Operating Range versus Tether Length

2. Wrap one of two turns of the cord around the pipe and lash it with cord, waterproof tape, or or plastic wire ties. Do not lash the cord with wire or other conductive material which could cut through the insulation.



WARNING!

The electric power used to operate the pump is high enough to cause injury or death. Disconnect and lock out the power before making connections.

3. Refer to the control box data sheet and make the required electrical connections. When the float switch is used for dewatering, use only the black and white leads; cut off the red lead and insulate the cut end with electrical tape. When the float switch is used for filling, use only the white and red leads; cut off the black lead and insulate the cut end with electrical tape.

4. Refer to the pump operation and maintenance manual and turn on the power. Check the level control system for proper operation. Adjust the position and length of the float switch cord if necessary to obtain the required on and off levels.

CAUTION!

When this switch is used to control a submersible pump, adjust the float switch to keep the liquid level above the top of the motor if possible. This prevents the pump from overheating. The submersible motor should not be required to start more than 6 times per hour. Repeated starts will cause the motor to overheat.

REPAIR

The construction of the float switch makes it resistant to sewage water, greases, oil, gasoline, and most acids and alkalies. No maintenance is required except to remove congealed grease or debris which may cling to the float switch and prevent proper operation. If the float switch is damaged or defective in any way, replace the switch and cord as a unit.

SPECIFICATIONS:

SWITCH: SINGLE POLE DOUBLE THROW
20AMPS AT 250VAC MAX. - 57VAC MIN.
OPERATING TEMP: 140 F (60C) MAX.
SWITCH HOUSING: ABS
CORD: #16/3 FLEXIBLE, OIL RESISTANT
SJOW-A JACKET

WIRING INFORMATION:

FLOAT DOWN POSITION:
WHITE-COMMON
BLACK-NORMALLY CLOSED (PUMP DOWN)

Sales/Mfg Nos.: C008023 PARTS LIST Assy Dwg : D46126665 REV A

Model : T3A60-B~ BASIC PUMP Rev No : 003

Options : BTH,VBT, .000-V W I P S E F *

Serial/# : 001136171N

Ref. No	Part Number	Description	Quantity
	T3A60-B	BASIC PUMP	1.000
	T3A60-B~	BASIC PUMP	1.000
	A1014 15991	MACH BOLT STL	2.000
BM	BM#04-03 17000	DRIVE SCREW SST	4.000
B	B0805-1/2 15991	HEX HD CAPSCR STL	4.000
B	B1007 15991	HEX HD CAPSCR STL	4.000
B	B1009 15991	HEX HD CAPSCR STL	4.000
	C1010 15991	STUD STL	2.000
94G	D06 15991	HEX NUT STL	2.000
13AS	GR-03	G-R DECAL 3 IN	1.000
K	J06 15991	LOCK WASHER STL	2.000
K	J08 15991	LOCK WASHER STL	4.000
K	J10 15991	LOCK WASHER STL	8.000
	OM-01927-03	IOM MANUAL	1.000
P	P04 15079	PIPE PLUG STL	3.000
P	P16 10009	PIPE PLUG CI	1.000
88	SM-00593	P SAFETY HANDBOOK	1.000
	S1748	O-RING TEFLON CTD	2.000
	10701 15040	HAND NUT CS	2.000
	11405B 10010	VOLUTE CASING CI	1.000
	11405B 10010#	VOLUTE CASING CI	1.000
	11407A 15990	WEAR PLATE ASSY	1.000
	11412 10010	SUCT FLANGE CI	1.000
	11412 10010#	SUCT FLANGE CI	1.000
	11412G 19370	GASKET NON-ASB	1.000
	11421	LUBE DECAL	1.000
	11557A 17010	CV PIN SST	1.000
	13130 17000 (P)	ADJ SHIM SET SST	4.000
	13130-1 17000	5DJ SHIM SST	8.000
	13130-2 17000	ADJ SHIM SST	8.000
	13130-3 17000	ADJ SHIM SST	4.000
	13130-4 17000	ADJ SHIM SST	4.000
	14759H	CARTON LINER	1.000
	1674GC 19370	FLG GASKET NON-ASB	1.000
	1753A 10010	FLANGE CI	1.000
90	18642-003	G-R BLUE WATER 5GL	.025
	2577CR	CARTON	1.000
	2613DK	INSTR LABEL	1.000
	2613M	ROTATION DECAL	1.000
	31912-009 15000	SCREW-CLAMP BAR MF	1.000
	31341-012 15000	THREADED ROD STL	1.000
	38111-004 11010	CLAMP BAR DI	1.000
	38111-004 11010#	CLAMP BAR DI	1.000
	38816-096	WARNING DECAL	1.000
88	38817-011	INSTR TAG PAPER	1.000
	38817-023	INSTR TAG PAPER	1.000
	38818-040 13990	NAME PLATE AL	1.000
	42111-344 (P)	COVER PLT ASSY CI	1.000
BM	BM#04-03 17000	DRIVE SCREW SST	2.000
	38241-005 10010	COVER PLATE CI	1.000

Sales/Mfg Nos.: C008023 PARTS LIST Assy Dwg : D46126665 REV A

Model : T3A60-B~ BASIC PUMP Rev No : 003

Options : BTH,VBT, .000-V W I P S E F *

Serial/# : 001136171N

Ref. No	Part Number	Description	Quantity
	38241-005 10010#	COVER PLATE CI	1.000
	38816-097 13990	WARNING PLATE AL	1.000
	50G 19210	COVER GASKET TEF	1.000
	42111-901 (P)	11397A COV PLT CI	1.000
BM	BM#04-03 17000	DRIVE SCREW SST	4.000
	11397A 10010	COVER PLATE CI	1.000
	11397A 10010#	COVER PLATE CI	1.000
	2613EV 13990	WARNING PLATE AL	1.000
	26662-005	PRESS RELIEF VALVE	1.000
	38816-302	WARNING DECAL	1.000
	44163-214	ROT ASSY T3A60	1.000
	AP0802 15079	RED PIPE BUSH STL	1.000
B	B0605 15991	HEX HD CAPSCR STL	4.000
B	B0805 15991	HEX HD CAPSCR STL	4.000
	DM1004S 15991	SOC HD CAPSCR STL	1.000
K	J06 15991	LOCK WASHER STL	4.000
K	J08 15991	LOCK WASHER STL	4.000
N	N0608 15990	KEY STL	1.000
	P08 15079	PIPE PLUG STL	2.000
P	P12 15079	PIPE PLUG STL	1.000
	S1352	OIL SEAL	2.000
	S1471	SIGHT GAUGE	1.000
	S1530	AIR VENT	1.000
	S1749	BALL BEARING	1.000
	S244	SNAP RING	1.000
	10278 15030	IMP WASHER CRS	1.000
	10959G 20000	GASKET CK	1.000
	11398 16040	IMP SHAFT ASTL	1.000
	13323-034	ROD RD 2 A STL	1.328
	11399A 10010	BEARING HOUSING CI	1.000
	11399A 10010#	BEARING HOUSING CI	1.000
	11406 11010	IMPELLER DI	1.000
	11406 11010#	IMPELLER DI	1.000
	11837D 10010	SEAL PLATE CI	1.000
	11837D 10010#	SEAL PLATE CI	1.000
	23252-013	BALL BEARING	1.000
	38322-219 10010	BEARING CAP CI	1.000
	38322-219 10010#	BEARING CAP CI	1.000
	38683-268 18000	BRG GSKT VEG FI	1.000
	46513-151	1 1/2 CTG SEAL ASY	1.000
	GL-03377-01	INST SHEET	1.000
	25140-110	PAPER TUBE W/CAP	1.000
	25140-111	SEAL CONTAINER CAP	1.000
	25154-022	O RING FLUOROCBN	1.000
	25154-132	O RING FLUOROCBN	1.000
	25154-227	O RING FLUOROCBN	1.000
	25271-211	MECH SEAL 1-1/2	1.000
	31185-015 17000	SPR CTR WASH MF	1.000
	31186-115 23030	SHEAR RING NYL	1.000
	31441-015 16000	SEAL SLV A STL	1.000

Sales/Mfg Nos.: C008023 PARTS LIST Assy Dwg : D46126665 REV A

Model : T3A60-B~ BASIC PUMP Rev No : 003

Options : BTH,VBT, .000-V W I P S E F *

Serial/# : 001136171N

Ref. No	Part Number	Description	Quantity
	33433-024 19460	SEPARATOR TAB PLS	2.000
	37J 17090 (P)	ADJ SHIM SET	1.000
	37J-1 17090	ADJ SHIM SST	2.000
	37J-2 17090	ADJ SHIM SST	2.000
	37J-3 17090	ADJ SHIM SST	1.000
	38328-115 17040	STA SL SEAT SST	1.000
	38329-057 12040	SEAL RING SC	2.000
	4823A 15079	VENTED PLUG STL	1.000
	46411-060	3IN FV ASSY BC NEO	1.000
	BT0405 15991	NYLOCK CAPSCR STL	2.000
	31411-088 15990	SPACER SLEEVE STL	2.000
	33291-006 11060	FV ADAPTOR DI	1.000
	33291-006 11060#	FV ADAPTOR DI	1.000
	33461-004 15020	BACK UP PLATE STL	1.000
	46411-059 24010	3IN MLD FV BC NEO	1.000
88	6588AG	SUCTION STICKER	1.000
	6588AH	FL HERE TO PRM STK	1.000
88	6588BJ	DISCHARGE STICKER	1.000
	11539 24000	V BASE WSTL	1.000
	11536A 24150	MOTOR RAIL ASSY	2.000
	12216-068	BAR F .25X1.25 STL	3.406
	12651-005	PLT .25X48X120 STL	.832
	34221-016 15020	CLIP STL	2.000
	12651-005	PLT .25X48X120 STL	.136
	34221-017 15020	CLIP STL	2.000
	12651-005	PLT .25X48X120 STL	.136
	11536B 15080	MOTOR RAIL STL	2.000
	12651-005	PLT .25X48X120 STL	1.178
	12651-005	PLT .25X48X120 STL	4.758
	42352-546 24150	BELT GUARD R H	1.000
B	B0403 15991	HEX HD CAPSCR STL	11.000
K	J04 15991	LOCK WASHER STL	11.000
K	K04 15991	FLAT WASHER STL	11.000
	21768-671	SPEED NUT STL	11.000
	33641-011 15080	BACKPLATE STL	1.000
	12618-085	SH 16GAX48X120 STL	3.344
	33713-005 15990	GUSSET STL	3.000
	12617-179	SH 11GAX48X120 STL	.108
	34116-003 15020	CLIP STL	2.000
	12618-085	SH 16GAX48X120 STL	.118
	34335-018 15080	BRACE STL	1.000
	12511-120	STRIP .18X1.5 STL	1.219
	34628-007 15020	GUARD BODY STL	1.000
	12617-115	SH 14GAX48X120 STL	7.246
	34715-082 15120	END PANEL LH STL	1.000
	12618-085	SH 16GAX48X120 STL	.552
	34715-083 15120	END PANEL RH STL	1.000
	12618-085	SH 16GAX48X120 STL	.552
08P	38816-062	GUARD WARNING STK	1.000
	28257-440	MOT 5 HP 3P TEFC	1.000

Sales/Mfg Nos.: C008023 PARTS LIST Assy Dwg : D46126665 REV A
Model : T3A60-B~ BASIC PUMP Rev No : 003
Options : BTH,VBT, .000-V W I P S E F *
Serial/# : 001136171N

Ref. No	Part Number	Description	Quantity
	3V0365OD2GR	SHEAVE	1.000
	3V0475OD2GR	SHEAVE	1.000
	3VX0530	BELT	2.000
	47811-007	CSG HTR ASSY 240V	1.000
	AP1208 15079	RED PIPE BUSH STL	1.000
	AP1608 11999	BUSH 1 X 1/2	1.000
	AP2016 11999	BUSH 1 1/4 X 1	1.000
	BM#04-04 17000	DRIVE SCREW SST	2.000
	CF#08-01 15991	RD PHLH MS STL	2.000
	GL-01946	INST SHEET	1.000
	J#08 15991	LOCK WASHER STL	2.000
P	P16 10009	PIPE PLUG CI	1.000
	US16 11999	SERVICE TEE DI	1.000
	27144-011	JUNCTION BOX	1.000
	27151-102	CONNECTOR	1.000
	27184-502	BUSH STL 3/4 X 1/2	2.000
	27284-003	CONNECTOR	1.000
	27891-114	HEATER PROBE	1.000
	31412-031 15130	CONDUIT STL	1.000
	18183-023	FT CND 1/2 UL STL	1.500
	47811-201	THERMOSTAT	1.000
	27471-180	FLOAT SWITCH 50'	1.000

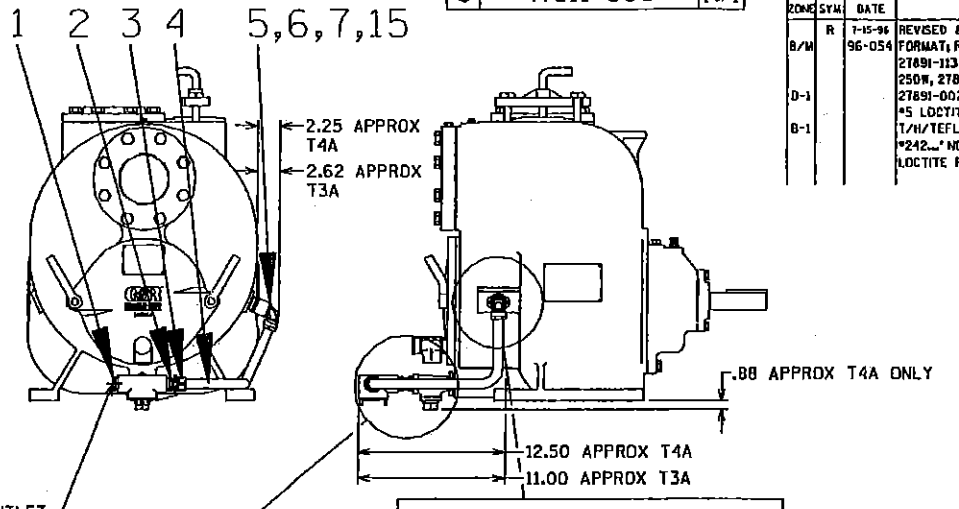
D-47811-006

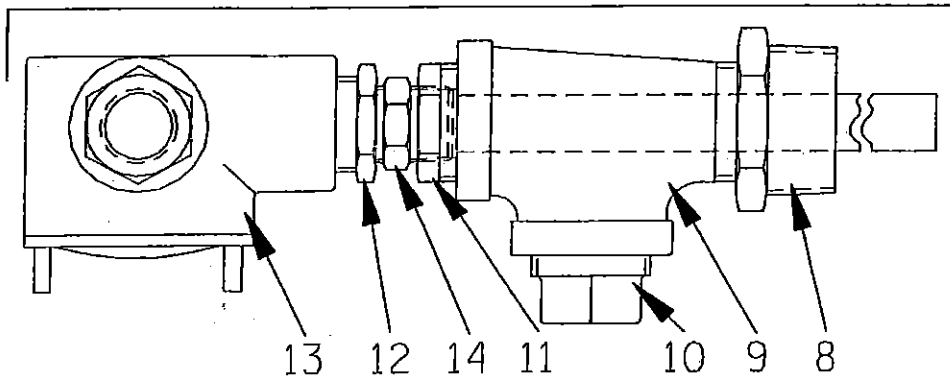
REF. NO.	PART NO.		DESCRIPTION		TOT. REQ.	ASSEMBLY
1	27184-502		RED PIPE BUSHING		1	ALL
2	27184-502		RED PIPE BUSHING		1	ALL
3	27151-102		CONNECTOR		1	ALL
4	31412-031	15130	CONDUIT	STL	1	ALL
5	47811-201		THERMOSTAT		1	ALL
6	CF*08-01	15991	RD PHLD MS	STL	2	ALL
7	J*08	15991	LOCK WASHER	STL	2	ALL
8	AP2016	11999	BUSHING	DI	1	ALL
9	US16	11999	SERVICE TEE	DI	1	ALL
10	P16	10009	PIPE PLUG	CI	1	ALL
11	AP1608	11999	BUSHING	DI	1	ALL
12	AP1208	15079	BUSHING	STL	1	ALL
13	27144-011		JUNCTION BOX		1	ALL
NOT SHOWN	27284-003		CONNECTOR		1	ALL
NOT SHOWN	GL-01946		INSTALLATION DWG.		1	ALL
	ALTERNATE COMPONENTS					
14	27891-113		HTR PROBE 500W/120V		1	47811-006
14	27891-114		HTR PROBE 500W/240V		1	47811-007
15	BM*04-04	17000	DRIVE SCREW	SST	1	ALL

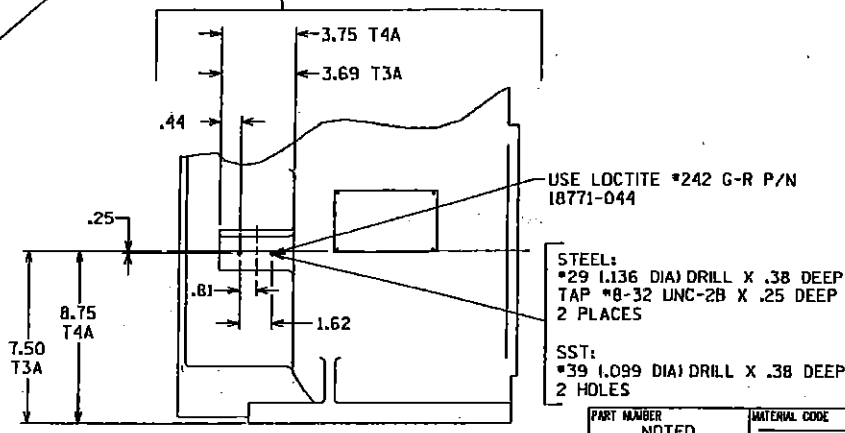
C 47811-006 SHEET 1 OF 1

REVISIONS

ZONE	SYM.	DATE	DESCRIPTION	DR.	CK.
B/M	R	7-15-96 96-054	REVISED & REDRAWN TO CAD FORMAT; REF NO 14 P/N 27891-113 WAS 27891-001 AND 250W, 27891-114 WAS 27891-002 AND 250W; NOTE #5 LOCTITE PST #567 WAS T/H/TEFLON; "USE LOCTITE #242..." NOTE WAS "USE LOCTITE PIPE SEALANT "HVV".	ELH	RLB
D-1					
B-1					







ASSEMBLY INSTRUCTIONS

1. REMOVE BACK COVER AND 1.00 DRAIN PLUG.
2. LOCATE AND DRILL THERMOSTAT MOUNTING HOLES.
3. MOUNT THERMOSTAT (P/N 47811-201) IN POSITION WITH MACHINE SCREWS (P/N CF*08-01) AND LOCK WASHERS (P/N J*08). FOR SST VOLUTES, USE (2) BM*04-04 DRIVE SCREWS IN LIEU OF MACHINE SCREWS.
4. APPLY LOCTITE PST #567 G-R P/N 18771-082 TO THE THREADS OF PIPE BUSHINGS (P/N AP1208 & 27184-502) AND INSTALL IN JUNCTION BOX (P/N 27144-011) OUTLETS.
5. INSTALL BUSHING (P/N AP1608), HEATER PROBE (REF. NO. 14) AND JUNCTION BOX (P/N 27144-011) IN SEQUENCE WITH JUNCTION BOX CAP IN DOWN POSITION. HEATER PROBE LEADS ARE TO BE THREADED INTO JUNCTION BOX.
6. ATTACH LIQUATITE CONNECTOR (P/N 27151-102) TO LEFT OUTLET OF JUNCTION BOX.
7. THREAD THERMOSTAT LEADS INTO CONDUIT (P/N 31412-031) AND SECURE CONDUIT WITH CONNECTORS ON THERMOSTAT AND JUNCTION BOX.
8. ATTACH (1) THERMOSTAT LEAD AND ONE (1) HEATER PROBE LEAD TOGETHER USING SOLDERLESS CONNECTOR (P/N 27284-003).
9. INSTALL JUNCTION BOX CAP.
10. INSTALL 1.00 DRAIN PLUG IN BOTTOM OUTLET OF SERVICE TEE.
11. REPLACE BACK COVER.
12. REMAINING JUNCTION BOX OUTLET TO BE USED BY CUSTOMER TO WIRE IN APPROPRIATE POWER SOURCE.

NOTES:

1. THE THERMOSTAT MAY BE INSTALLED ON THE OPPOSITE SIDE OF THE CASING BY USING THESE INSTRUCTIONS.
2. CHECK THERMOSTAT WIRES WITH A CONTINUITY LIGHT BEFORE CONNECTING TO HEATER PROBE AT ASSEMBLY. (SWITCH SHOULD BE OPEN)
3. KITS TO BE SHIPPED SHOULD BE INSPECTED BY SAME METHOD BEFORE GOING TO CUSTOMER.
4. REF NO 8 P/N AP2016 TO BE USED ON T4A SERIES ONLY.

ADVERTISING FORM NO.: GL-01946

PART NUMBER: NOTED | MATERIAL CODE:
CAD/CAM FILE NUMBER: 47811006.S01
ASSEMBLY (REFERENCES) | MODEL (REFERENCE): T3A3-B & T4A3-B

THE GORMAN-RUPP CO.
MANSFIELD, OHIO ST. THOMAS, ONTARIO
F.S.C.M. NO. 25567

UNLESS SPECIFIED, MACHINING TOLERANCE: .X +/- .015, .XX +/- .010, .XXX +/- .005, ANGLES +/- 1/2°

DO NOT SCALE DRAWING

APPROVAL	DATE
DWN. ELH	7-15-96
CHK. R.B.	8-22-96
APPR. RLB	8-22-96

MATERIAL: DESCRIPTION: SEE B/M
SPECIFICATION NUMBER | LENGTH/AREA (COSTING)

TITLE: CASING HEATER & THERMOSTAT INSTALL & ASSY INSTR (T4A,T3A)
DRAWING NUMBER: 47811-006 SIZE: C
DIST. CODE 01 | SCALE NONE | SHEET 1 OF 1

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C

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OM-01927-OB03
November 14, 1996

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST

GORMAN-RUPP PUMPS

T SERIES PUMP

MODEL

T3A60–B

INCLUDING: /F, /FM

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.

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INTRODUCTION

This Installation, Operation, and Maintenance manual is designed to help you achieve the best performance and longest life from your Gorman-Rupp pump.

This pump is a T Series, semi-open impeller, self-priming centrifugal model with a suction check valve. The pump is designed for handling mild industrial corrosives, residues, and slurries containing large entrained solids. The basic material of construction is gray iron, with ductile iron impeller and steel wearing parts.

If there are any questions regarding the pump or its application which are not covered in this manual or in other literature accompanying this unit, please contact your Gorman-Rupp distributor, or write:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901-1217

or

Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7

For information or technical assistance on the power source, contact the power source manufacturer's local dealer or representative.

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:

DANGER!

Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.

WARNING!

Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.

CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

SAFETY – SECTION A

These warnings apply to T Series basic pumps. Gorman-Rupp has no control over or particular knowledge of the power source which will be used. Refer to the manual accompanying the power source before attempting to begin operation.

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect or lock out the power source to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.

This pump is designed to handle mild industrial corrosives, residues, and slurries containing large entrained solids. Do not attempt to pump volatile, corrosive, or flammable materials which may damage the pump or endanger personnel as a result of pump failure.

After the pump has been positioned, make certain that the pump and all piping connections are tight, properly supported and secure before operation.

Do not operate the pump without the guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. Suction and discharge hoses and piping must be removed from the pump before lifting.

INSTALLATION – SECTION B

Review all SAFETY information in Section A.

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect, position, and arrange the pump and piping.

Most of the information pertains to a standard **static lift application** where the pump is positioned above the free level of liquid to be pumped.

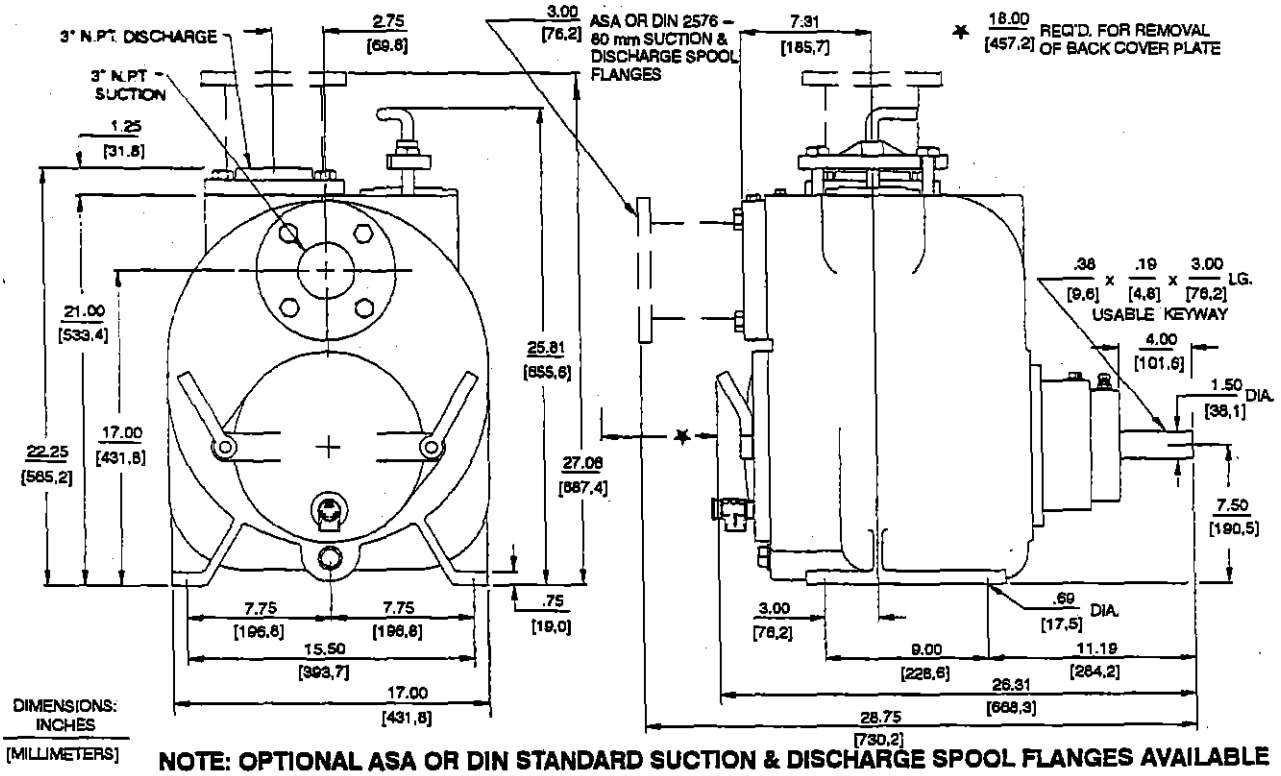
If installed in a **flooded suction application** where the liquid is supplied to the pump under pressure, some of the information such as mounting, line configuration, and priming must be tailored to the specific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to **50%** of the maximum permissible operating pressure as shown on the pump performance curve.

For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Pump Dimensions

See Figure 1 for the approximate physical dimensions of this pump.

OUTLINE DRAWING



NOTE: OPTIONAL ASA OR DIN STANDARD SUCTION & DISCHARGE SPOOL FLANGES AVAILABLE

Figure 1. Pump Model T3A60-B

compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction. Using piping couplings in suction lines is not recommended.

Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

Connections to Pump

Before tightening a connecting flange, align it exactly with the pump port. Never pull a pipe line into place by tightening the flange bolts and/or couplings.

Lines near the pump must be independently supported to avoid strain on the pump which could cause excessive vibration, decreased bearing life, and increased shaft and seal wear. If hose-type lines are used, they should have adequate support to secure them when filled with liquid and under pressure.

Gauges

Most pumps are drilled and tapped for installing discharge pressure and vacuum suction gauges. If these gauges are desired for pumps that are not tapped, drill and tap the suction and discharge lines not less than 18 inches (457,2 mm) from the suction and discharge ports and install the lines. Installation closer to the pump may result in erratic readings.

SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

Strainers

If a strainer is furnished with the pump, be certain to use it; any spherical solids which pass through a strainer furnished with the pump will also pass through the pump itself.

If a strainer is not furnished with the pump, but is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling capability of the pump.

This pump is designed to handle up to 2-1/2 inch (63,5 mm) diameter spherical solids.

Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift, all connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Follow the sealant manufacturer's recommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 1 1/2 times the diameter of the suction line.

If there is a liquid flow from an open pipe into the sump, the flow should be kept away from the suction inlet because the inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

from excessive shock pressure and reverse rotation when it is stopped.

CAUTION

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

Bypass Lines

Self-priming pumps are not air compressors. During the priming cycle, air from the suction line must be vented to atmosphere on the discharge side. If the discharge line is open, this air will be vented through the discharge. However, if a check valve has been installed in the discharge line, the discharge side of the pump must be opened to atmospheric pressure through a bypass line installed between the pump discharge and the check valve. A self-priming centrifugal pump **will not prime** if there is sufficient static liquid head to hold the discharge check valve closed.

NOTE

The bypass line should be sized so that it does not affect pump discharge capacity; however, the bypass line should be at least 1 inch (25,4 mm) in diameter to minimize the chance of plugging.

In **low discharge head applications** (less than 30 feet or 9 meters), it is recommended that the bypass line be run back to the wet well, and located 6 inches below the water level or cut-off point of the low level pump. In some installations, this bypass line may be terminated with a six-to-eight foot length of 1 1/4 inch I.D. **smooth-bore** hose; air and liquid vented during the priming process will then agitate the hose and break up any solids, grease, or other substances likely to cause clogging.

CAUTION

A bypass line that is returned to a wet well must be secured against being drawn into the pump suction inlet.

It is also recommended that pipe unions be installed at each 90° elbow in a bypass line to ease disassembly and maintenance.

In **high discharge head applications** (more than 30 feet), an excessive amount of liquid may be bypassed and forced back to the wet well under the full working pressure of the pump; this will reduce overall pumping efficiency. **Therefore, it is recommended that a Gorman-Rupp Automatic Air Release Valve be installed in the bypass line.**

Gorman-Rupp Automatic Air Release Valves are reliable, and require minimum maintenance. See **AUTOMATIC AIR RELEASE VALVE** in this section for installation and theory of operation of the Automatic Air Release Valve. Consult your Gorman-Rupp distributor, or contact the Gorman-Rupp Company for selection of an Automatic Air Release Valve to fit your application.

If the installation involves a flooded suction such as a below-ground lift station. A pipe union and manual shut-off valve may be installed in the bleed line to allow service of the valve without shutting down the station, and to eliminate the possibility of flooding. If a manual shut-off valve is installed **anywhere** in the air release piping, it **must** be a full-opening **ball type** valve to prevent plugging by solids.

WARNING!

If a manual shut-off valve is installed in a bypass line, it must not be left closed during operation. A closed manual shut-off valve may cause a pump which has lost prime to continue to operate without reaching prime, causing dangerous overheating and possible explosive rupture of the pump casing. Personnel could be severely injured.

Allow an over-heated pump to cool before servicing. Do not remove plates, covers, gauges, or fittings from an overheated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump cools,

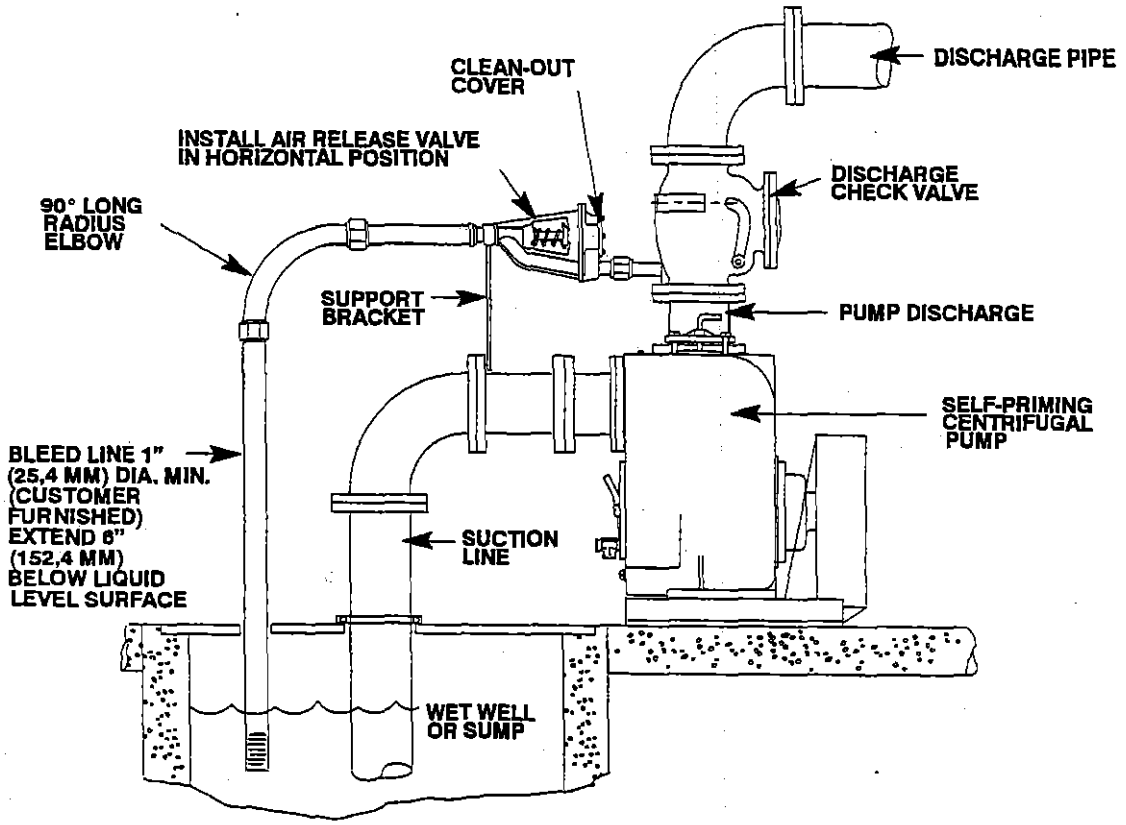


Figure 5. Typical Automatic Air Release Valve Installation

The valve inlet line must be installed between the pump discharge port and the non-pressurized side of the discharge check valve. The valve inlet is at the large end of the valve body, and is provided with standard 1-inch NPT pipe threads.

The valve outlet is located at the opposite end of the valve, and is also equipped with standard 1-inch NPT pipe threads. The outlet should be connected to a bleed line which slopes back to the wet well or sump. The bleed line must be the same size as the inlet piping, or larger. If **piping** is used for the bleed line, avoid the use of elbows whenever possible.

NOTE

It is recommended that each Air Release Valve be fitted with an independent bleeder line directed back to the wet well. However, if multiple Air Release Valves are installed in a system, the bleeder lines may be directed to a common manifold pipe. Contact your Gorman-Rupp distributor or the Gorman-Rupp Company for information about installation of an Automatic Air Release Valve for your specific application.

ALIGNMENT

The alignment of the pump and its power source is critical for trouble-free mechanical operation. In either a flexible coupling or V-belt driven system, the driver and pump must be mounted so that their shafts are aligned with and parallel to each other. It is imperative that alignment be checked after the pump and piping are installed, and before operation.

NOTE

Check **Rotation,** *Section C, before final alignment of the pump.*

When mounted at the Gorman-Rupp factory, driver and pump are aligned before shipment. Misalignment will occur in transit and handling. Pumps **must** be checked and realigned before operation. Before checking alignment, tighten the foundation bolts. The pump casing feet and/or pedestal feet, and the driver mounting bolts should also be tightly secured.

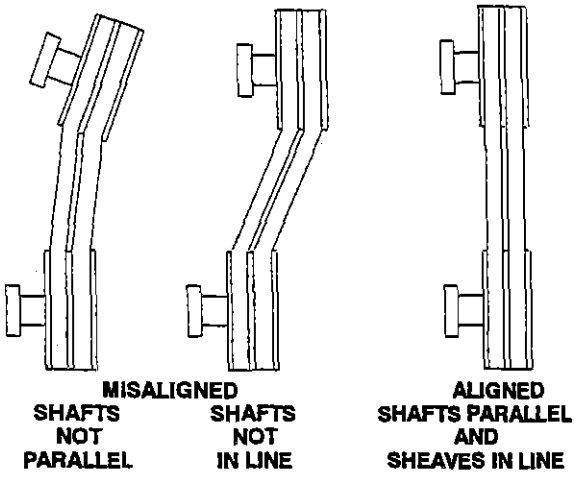


Figure 6C. Alignment of V-Belt Driven Pumps

Tighten the belts in accordance with the belt manufacturer's instructions. If the belts are too loose, they will slip; if the belts are too tight, there will be excessive power loss and possible bearing failure. Select pulleys that will match the proper speed ratio; overspeeding the pump may damage both pump and power source.

WARNING!

Do not operate the pump without the guard in place over the rotating parts. exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

OPERATION – SECTION C

Review all SAFETY information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.

WARNING!

This pump is designed to handle mild industrial corrosives, residues, and slurries containing large entrained solids. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.

CAUTION

Pump speed and operating conditions must be within the performance range shown on page E-1.

PRIMING

Install the pump and piping as described in **INSTALLATION**. Make sure that the piping connections are tight, and that the pump is securely mounted. Check that the pump is properly lubricated (see **LUBRICATION** in **MAINTENANCE AND REPAIR**).

This pump is self-priming, but the pump should never be operated unless there is liquid in the pump casing.

CAUTION

Never operate this pump unless there is liquid in the pump casing. The pump will not prime when dry. extended operation of a dry pump will destroy the seal assembly.

Add liquid to the pump casing when:

1. The pump is being put into service for the first time.
2. The pump has not been used for a considerable length of time.
3. The liquid in the pump casing has evaporated.

Once the pump casing has been filled, the pump will prime and reprime as necessary.

WARNING!

After filling the pump casing, reinstall and tighten the fill plug. Do not attempt to operate the pump unless all connecting piping is securely installed. Otherwise, liquid in the pump forced out under pressure could cause injury to personnel.

To fill the pump, remove the pump casing fill cover or fill plug in the top of the casing, and add clean liquid until the casing is filled. Replace the fill cover or fill plug before operating the pump.

STARTING

Consult the operations manual furnished with the power source.

Rotation

The correct direction of pump rotation is counterclockwise when facing the impeller. The pump could be damaged and performance adversely affected by incorrect rotation. If pump performance is not within the specified limits (see the curve on page E-1), check the direction of power source rotation before further troubleshooting.

If an electric motor is used to drive the pump, remove V-belts, couplings, or otherwise disconnect the pump from the motor before checking motor rotation. Operate the motor independently while

does occur, stop the pump immediately and allow it to cool before servicing it. **Approach any overheated pump cautiously.** It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump casing overheats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Strainer Check

If a suction strainer has been shipped with the pump or installed by the user, check the strainer regularly, and clean it as necessary. The strainer should also be checked if pump flow rate begins to drop. If a vacuum suction gauge has been installed, monitor and record the readings regularly to detect strainer blockage.

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, liquid pressure **must** be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve.

Pump Vacuum Check

With the pump inoperative, install a vacuum gauge in the system, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches (508,0 mm) or more of mercury. If it does not, check for air leaks in the seal, gasket, or discharge valve.

Open the suction line, and read the vacuum gauge with the pump primed and at operation speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, an air leak exists. Before checking for the source of the leak, check the point of installation of the vacuum gauge.

STOPPING

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

On engine driven pumps, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.

CAUTION

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

After stopping the pump, lock out or disconnect the power source to ensure that the pump will remain inoperative.

Cold Weather Preservation

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump for approximately one minute; this will remove any remaining liquid that could freeze the pump rotating parts. If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, drain the pump, and flush it thoroughly with clean water. To prevent large solids from clogging the drain port and preventing the pump from completely draining, insert a rod or stiff wire in the drain port, and agitate the liquid during the draining process. Clean out any remaining solids by flushing with a hose.

BEARING TEMPERATURE CHECK

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Temperatures up to 160°F (71° C) are considered normal for bearings, and they can operate safely to at least 180°F (82° C).

Checking bearing temperatures by hand is inaccurate. Bearing temperatures can be measured ac-

TROUBLESHOOTING – SECTION D

Review all SAFETY information in Section A.

Before attempting to open or service the pump:

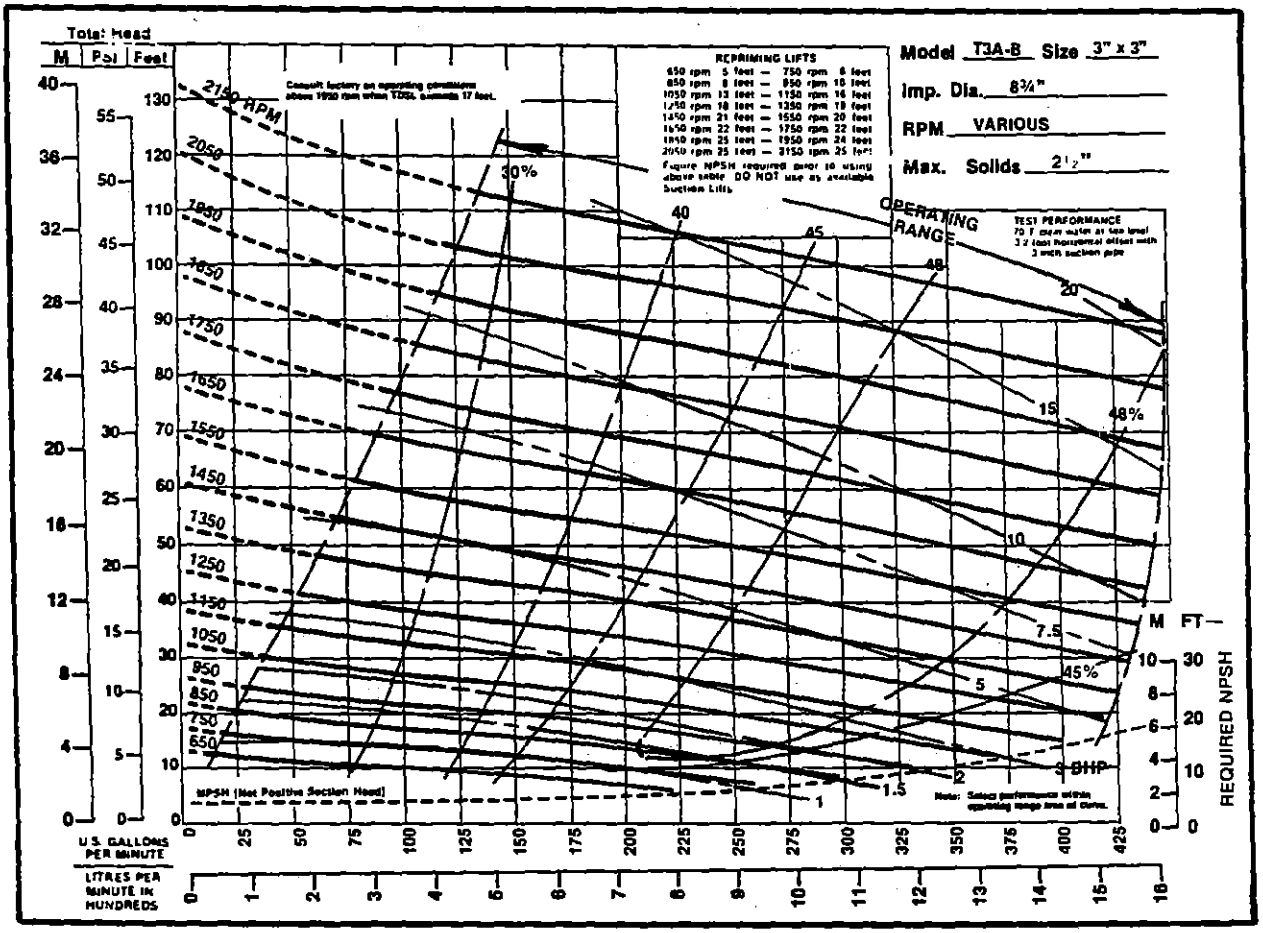
1. **Familiarize yourself with this manual.**
2. **Lock out or disconnect the power source to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing.	Add liquid to casing. See **PRIMING.**
	Suction check valve contaminated or damaged.	Clean or replace check valve.
	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See **INSTALLATION.**
	Strainer clogged.	Check strainer and clean if necessary.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.	Check bearing temperature regularly to monitor any increase.
	Low or incorrect lubricant.	Check for proper type and level of lubricant.
	Suction and discharge lines not properly supported.	Check piping installation for proper support.
	Drive misaligned.	Align drive properly.

PUMP MAINTENANCE AND REPAIR – SECTION E

MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.



*** STANDARD PERFORMANCE FOR PUMP MODEL T3A60-B**

*Based on 70° F (21° C) clear water at sea level with minimum suction lift. Since pump installations are seldom identical, your performance may be different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify performance or part numbers.

CAUTION

Pump speed and operating condition points must be within the continuous performance range shown on the curve.

PARTS LIST
Pump Model T3A60-B
(From S/N 1105021 up)

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify part numbers.

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PUMP CASING	11405B	10010	1
2 *	REPAIR ROTATING ASSY	44163-215	---	1
3	PIPE PLUG	P04	15079	1
4 *	DISCH FLANGE GSKT	1674GC	19370	1
5	DISCHARGE FLANGE	1753A	10010	1
6	HEX HD CAPSCREW	B1007	15991	4
7	LOCKWASHER	J10	15991	4
8 *	ROTATING ASSY O-RING	S1748	---	REF
9	HEX HD CAPSCREW	B0605 1/2	15991	4
10	LOCKWASHER	J08	15991	4
11 *	ROT ASSY SHIM SET	13130	17000	REF
12 *	WEAR PLATE ASSY	11407A	15990	1
13	HEX NUT	D06	15991	2
14	LOCKWASHER	J06	15991	2
15	CASING DRAIN PLUG	P16	10009	1
16 *	BACK COVER O-RING	S1748	---	1
17	HAND NUT	10701	15040	2
18	STUD	C1010	15991	2
19	BACK CVR PLATE ASSY	42111-901	---	1
20	-BACK COVER PLATE	NOT AVAILABLE		1
21	-WARNING PLATE	2613EV	13990	1
22	-DRIVE SCREW	BM#04-03	17000	4
23	-PRESS RELIEF VALVE	26662-005	---	1
24	-CAUTION DECAL	2613FG	---	1
25 *	SUCTION FLANGE GSKT	11412G	19370	1
26	SUCTION FLANGE	11412	10010	1
27	HEX HD CAPSCREW	B1009	15991	4
28	LOCKWASHER	J10	15991	4
29	PIPE PLUG	P04	15079	1
30 *	SUCT CHK VALVE ASSY	46411-060	---	1
31	CHECK VALVE PIN	11557A	17010	1
32	PIPE PLUG	P04	15079	1
33	CLAMP BAR	38111-004	11010	1
34	MACHINE BOLT	A1014	15991	2
35	CLAMP BAR SCREW	31912-009	15000	1
36	FILL COVER ASSY	42111-344	---	1
37	-FILL COVER PLATE	NOT AVAILABLE		1
38	-WARNING PLATE	38816-097	13990	1
39	-DRIVE SCREW	BM#04-03	15990	2
40	-COVER GASKET	50G	19210	1
NOT SHOWN:				
	NAME PLATE	38816-040	13990	1
	DRIVE SCREW	BM#04-03	17000	4
	ROTATION DECAL	2613M	---	1
	LUBE DECAL	11421	---	1
	SUCTION STICKER	6588AG	---	1
	DISCHARGE STICKER	6588BJ	---	1
	PRIMING STICKER	6588AH	---	1
	WARNING DECAL	38816-096	---	1
	INSTRUCTION DECAL	2613DK	---	1
OPTIONAL:				
	DISASSEMBLY TOOL	12859	24000	1
	CLEANOUT KIT	48783-001	---	1
	/F FLANGE KIT	48213-040	---1	
	-SUCTION	11412A	10010	1
	-DISCHARGE	10845	10010	1
	/FM METRIC FLANGE KIT	48213-076	---	1
	-SUCTION	38642-208	10010	1
	-DISCHARGE	38642-209	10000	1
	WEAR PLATE ASSY	46451-337	24160	1
	CASING HEATERS:			
	-120V	47811-006	---	1
	-240V	47811-007	---	1
	CHECK VALVE ASSYS:			
	-NEO SOLID TYPE	46411-043	---	1
	-VITON SOLID	46411-086	---	1
	-VITON BLOW-OUT	46411-074	---	1
	-BUNA-N	46411-102	---	1
	PRESS RELIEF VALVES:			
	-SEWAGE TYPE	46431-628	---	1
	-STAINLESS STEEL	26662-101	---	1
	HI TEMP SHUT-DOWN KITS:			
	-145°F	48313-186	---	1
	-130°F	48313-256	---	1
	-120°F	48313-257	---	1
	AIR RELEASE VALVES:			
	-10# COMP SPRING	GRP33-07A	---	1
	-25# COMP SPRING	GRP33-07	---	1
	-60# COMP SPRING	GRP33-07B	---	1

* INDICATES PARTS RECOMMENDED FOR STOCK

Above Serial Numbers Do Not Apply To Pumps Made In Canada.

CANADIAN SERIAL NO. ..... AND UP

PARTS LIST
44163–215 Repair Rotating Assembly

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1	*	IMPELLER	11406	11010	1
2	*	SEAL ASSEMBLY	46513–151	---	1
3	*	SEAL PLATE GASKET	10959G	20000	1
4	*	INBOARD OIL SEAL	S1352	---	1
5	*	INBOARD BALL BEARING	23252–013	---	1
6		BEARING HOUSING	11399A	10010	1
7		VENTED PLUG	4823A	15079	1
8		AIR VENT	S1530	---	1
9		REDUCING PIPE BUSHING	AP0802	15079	1
10	*	BEARING CAP GASKET	38683–268	18000	1
11		BEARING CAP	38322–219	10010	1
12		BEARING RETAINING RING	S244	---	1
13		HEX HD CAPSCREW	B0605	15991	4
14		LOCKWASHER	J06	15991	4
15	*	BEARING CAP OIL SEAL	S1352	---	1
16	*	SHAFT KEY	N0608	15990	1
17	*	IMPELLER SHAFT	11398	16040	1
18	*	OUTBOARD BALL BEARING	S1749	---	1
19	*	SEAL SLEEVE O-RING	S2088	---	REF
20		HEX HD CAPSCREW	B0805	15991	4
21		LOCKWASHER	J08	15991	4
22		SEAL PLATE	11837D	10010	1
23	*	IMPELLER ADJ SHIM SET	37J	17090	REF
24		IMPELLER WASHER	10278	15030	1
25		SOCKET HD CAPSCREW	DM1004S	15991	1
26		SIGHT GAUGE	S1471	---	1
27		SEAL CAVITY DRAIN PLUG	P08	15079	1
28		BEARING HOUSING DRAIN PLUG	P08	15079	1
29		PIPE PLUG	P12	15079	1
30	*	ROTATING ASSY O-RING	S1748	---	1
31		SHIPPING PLUG	11495B	15079	2
32	*	ROTATING ASSY ADJ SHIM SET	13130	17000	4
OPTIONAL:					
		SST IMPELLER WASHER	10278	17090	1
		SST IMPELLER CAPSCREW	DM1004S	17090	1
	†	PERMALON COATED SEAL	46512–150	---	1
	†	STD MECHANICAL SEAL ASSEMBLY	46512–047	---	1
	†	MECH SEAL SHAFT SLEEVE	11876A	16000	1
		ADI IMPELLER	11406	1102H	1
		IMPELLER SHAFT (LESS SLEEVE)	11398A	1706H	1
		–SEAL ASSY	46512–047	---	1
		–SPACER WASHER	38329–040	17030	1

* INDICATES PARTS RECOMMENDED FOR STOCK

† MECHANICAL SEAL SHAFT SLEEVE **MUST** BE USED WITH OPTIONAL MECHANICAL SEAL(S).

The impeller (1) should be loosened while the rotating assembly is still secured to the pump casing. Before loosening the impeller, remove the seal cavity drain plug (27) and drain the seal lubricant. This will prevent the oil in the seal cavity from escaping when the impeller is loosened. Clean and reinstall the seal cavity drain plug.

Immobilize the impeller by wedging a block wood between the vanes and the pump casing, and remove the impeller capscrew and washer (24 and 25).

Install the shaft key (16). Install a lathe dog on the drive end of the shaft (17) with the "V" notch positioned over the shaft key.

With the impeller rotation still blocked, see Figure 3 and use a long piece of heavy bar stock to pry against the arm of the lathe dog in a counterclockwise direction (when facing the drive end of the shaft). **Use caution** not to damage the shaft or keyway. When the impeller breaks loose, remove the lathe dog, key and wood block.

NOTE

Do not remove the impeller until the rotating assembly has been removed from the pump casing.

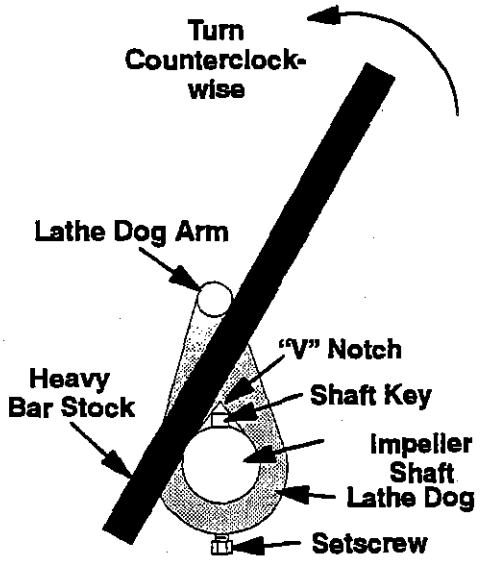


Figure 3. Loosening Impeller

(Figure 1)

Remove the hardware (9 and 10) securing the rotating assembly to the pump casing. Separate the rotating assembly by pulling straight away from the pump casing.

NOTE

An optional disassembly tool is available from the factory. If the tool is used, follow the instructions packed with it. A similar tool may be assembled using 1/2-inch pipe (schedule 80 steel or malleable iron) and a standard tee (see Figure 4). All threads are 1/2-inch NPT. ***Do not pre-assemble the tool.***

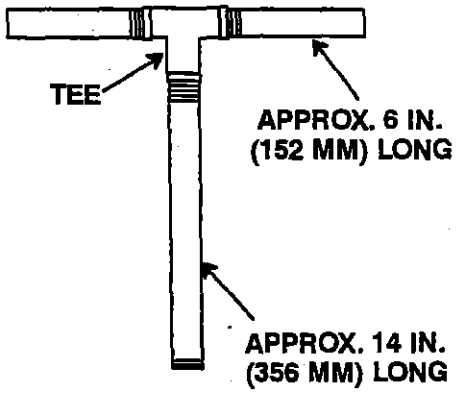


Figure 4. Rotating Assembly Tool

To install the tool, remove the air vent (7, Figure 2) from the bearing housing, and screw the longest length of pipe into the vent hole until fully engaged. Install the tee, and screw the handles into the tee. Use caution when lifting the rotating assembly to avoid injury to personnel or damage to the assembly.

Remove the bearing housing O-ring (8).

Impeller Removal

(Figure 2)

With the rotating assembly removed from the pump casing, unscrew the impeller from the shaft. Use caution when unscrewing the impeller; tension on the shaft seal spring will be released as the impeller is removed. Inspect the impeller and replace if cracked or badly worn.

Remove the impeller adjusting shims (23); tie and tag the shims, or measure and record their thickness for ease of reassembly.

If bearing replacement is required, remove the outboard bearing retaining ring (12), and use a bearing puller to remove the bearings from the shaft.

Press the inboard oil seal (4) from the bearing housing.

Shaft and Bearing Reassembly and Installation

(Figure 2)

Clean the bearing housing, shaft and all component parts (except the bearings) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage as necessary.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Inspect the shaft for distortion, nicks or scratches, or for thread damage on the impeller end. Dress small nicks and burrs with a fine file or emery cloth. Replace the shaft if defective.

Position the inboard oil seal (4) in the bearing housing bore with the lip positioned as shown in Figure 2. Press the oil seal into the housing until the face is **just flush** with the machined surface on the housing.

CAUTION

To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

NOTE

Position the inboard bearing (5) on the shaft with the shielded side toward the impeller end of the shaft. Position the outboard bearing (10) on the shaft with the integral retaining ring on the bearing O.D. toward the drive end of the shaft.

The bearings may be heated to ease installation. An induction heater, hot oil bath, electric oven, or hot plate may be used to heat the bearings. Bearings should **never** be heated with a direct flame or directly on a hot plate.

NOTE

*If a hot oil bath is used to heat the bearings, both the oil and the container must be **absolutely** clean. If the oil has been previously used, it must be **thoroughly** filtered.*

Heat the bearings to a uniform temperature **no higher than** 250°F (120°C), and slide the bearings onto the shaft, one at a time, until they are fully seated. This should be done quickly, in one continuous motion, to prevent the bearings from cooling and sticking on the shaft.

After the bearings have been installed and allowed to cool, check to ensure that they have not moved away from the shaft shoulders in shrinking. If movement has occurred, use a suitable sized sleeve and a press to reposition the bearings against the shaft shoulders.

If heating the bearings is not practical, use a suitable sized sleeve, and an arbor (or hydraulic) press to install the bearings on the shaft.

CAUTION

When installing the bearings onto the shaft, **never** press or hit against the outer race, balls, or ball cage. Press **only** on the inner race.

Secure the outboard bearing on the shaft with the bearing retaining ring (12).

Slide the shaft and assembled bearings into the bearing housing until the retaining ring on the outboard bearing seats against the bearing housing.

CAUTION

When installing the shaft and bearings into

CAUTION

This seal is not designed for operation at temperatures above 160°F (71°C). Do not use at higher operating temperatures.

If the seal plate was removed, install the seal plate gasket (3). Position the seal plate over the shaft and secure it to the bearing housing with the hardware (20 and 21).

To prevent damaging the shaft sleeve O-ring (19) on the shaft threads, stretch the O-ring over a piece of tubing 1-1/4 I.D. x 1-1/2 O.D. x 2-inches long (32 mm x 38 mm x 51 mm). Slide the tube over the shaft threads, then slide the O-ring off the tube and onto the shaft. Remove the tube, and continue to slide the O-ring down the shaft until it seats against the shaft shoulder.

When installing a new cartridge seal assembly, remove the seal from the container, and remove the mylar storage tabs from between the seal faces.

CAUTION

New cartridge seal assemblies are equipped with mylar storage tabs between the seal faces. These storage tabs **must** be removed before installing the seal.

Lubricate the external stationary seat O-ring with light oil. Slide the seal assembly onto the shaft until the external stationary seat O-ring engages the bore in the seal plate.

Clean and inspect the impeller as described in **Impeller Installation and Adjustment.** Install the full set of impeller shims (23) provided with the seal, and screw the impeller onto the shaft until it is seated against the seal (see Figure 6).

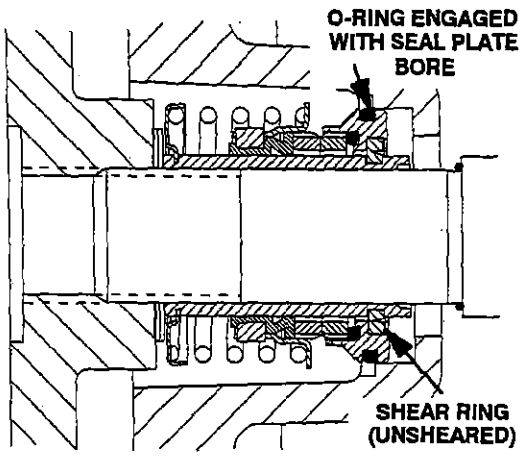


Figure 6. Seal Partially Installed

Continue to screw the impeller onto the shaft. This will press the stationary seat into the seal plate bore.

NOTE

A firm resistance will be felt as the impeller presses the stationary seat into the seal plate bore.

As the stationary seat becomes fully seated, the seal spring compresses, and the shaft sleeve will break the nylon shear ring. This allows the sleeve to slide down the shaft until seated against the shaft shoulder. Continue to screw the impeller onto the shaft until the impeller, shims, and sleeve are fully seated against the shaft shoulder (see Figure 7).

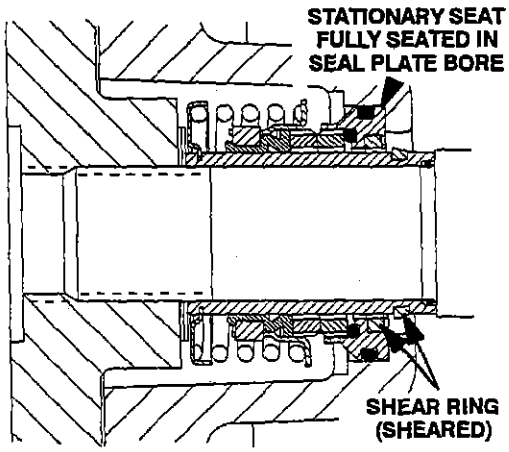


Figure 7. Seal Fully Installed

Measure the impeller-to-seal plate clearance, and remove impeller adjusting shims to obtain the proper clearance as described in **Impeller Installation and Adjustment.**

NOTE

*Proceed with **Rotating Assembly Installation** before installing the impeller capscrew and washer (24 and 25). The rotating assembly must be installed in the pump casing in order to torque the impeller capscrew.*

After the rotating assembly is installed in the pump casing, coat the threads of the impeller capscrew (25) with 'Never-Seez' or equivalent compound, and install the impeller washer (24) and capscrew; torque the capscrew to 90 ft. lbs. (1080 in. lbs. or 12,4 m. kg.).

Rotating Assembly Installation

(Figure 1)

NOTE

If the pump has been completely disassembled, it is recommended that the suction check valve and back cover assembly be reinstalled at this point. The back cover assembly must be in place to adjust the impeller face clearance.

Install the bearing housing O-ring (8) and lubricate it with light grease. Ease the rotating assembly into the pump casing using the installation tool. **Be careful** not to damage the O-ring.

Install the four sets of rotating assembly adjusting shims (11) using the same thickness as previously removed. Secure the rotating assembly to the pump casing with the hardware (9 and 10). **Do not** fully tighten the capscrews until the back cover has been reinstalled and the impeller face clearance has been set.

A clearance of .010 to .020 inch (0,25 to 0,51 mm) between the impeller and the wear plate is also recommended for maximum pump efficiency. This clearance can be obtained by removing an equal amount of shims from each rotating assembly shim set until the impeller scrapes against the wear plate when the shaft is turned. After the impeller scrapes, add approximately .015 inch (0,4 mm) of shims to each shim set.

NOTE

An alternate method of adjusting this clearance is to reach through the suction port with a feeler gauge and measure the gap. Add or subtract rotating assembly shims accordingly.

Suction Check Valve Installation

(Figure 1)

Inspect the check valve assembly (30), and replace it if badly worn.

NOTE

The check valve assembly must be replaced as a complete unit. Individual parts are not sold separately.

Reach through the back cover opening with the check valve (30), and position the check valve adaptor in the mounting slot in the suction flange (26). Align the adaptor with the flange hole, and secure the assembly with the check valve pin (31).

NOTE

If the suction or discharge flanges were removed, replace the respective gaskets, apply 'Permatex Aviation No. 3 Form-A-Gasket' or equivalent compound to the mating surfaces, and secure them to the pump casing with the attaching hardware.

Back Cover Installation

(Figure 1)

If the wear plate (12) was removed for replacement, carefully center it on the back cover and secure it with the hardware (13 and 14). The wear plate **must** be concentric to prevent binding when the back cover is installed.

Replace the back cover O-ring (16), and lubricate it with a generous amount of No. 2 grease. Clean any scale or debris from the contacting surfaces in the pump casing that might interfere or prevent a good seal with the back cover. Slide the back cover assembly into the pump casing. Be sure the wear plate does not bind against the impeller.

NOTE

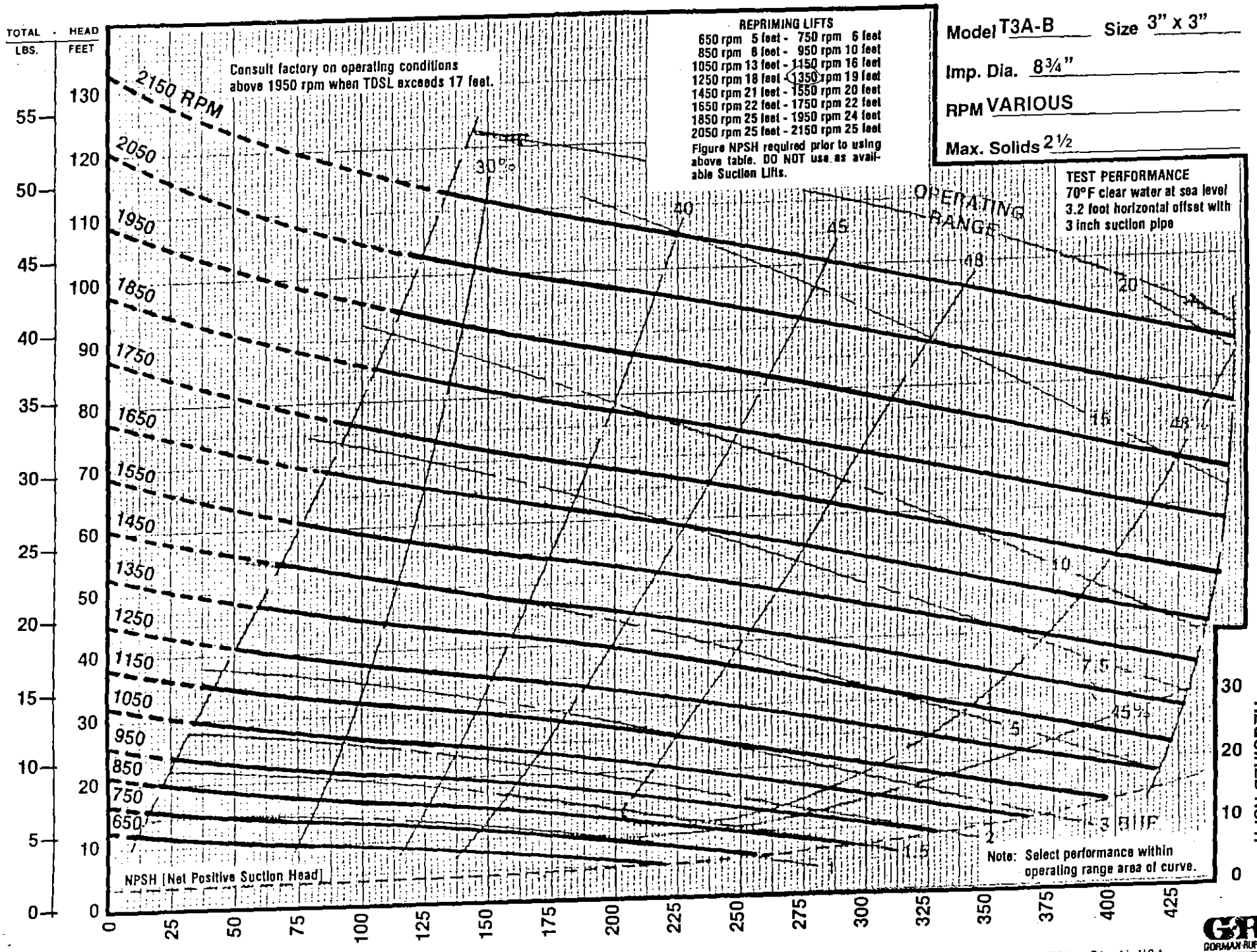
To ease future disassembly, apply a film of grease or 'Never-Seez' on the back cover shoulder, or any surface which contacts the pump casing. This action will reduce rust and scale build-up.

portant in areas where variable hot and cold temperatures are common.

For cold weather operation, consult the factory or a lubricant supplier for the recommended grade of oil.

Power Source

Consult the literature supplied with the power source, or contact your local power source representative.



PERFORMANCE CHART NO. T3A-4 2-21-79

SECTION 55 PAGE 1054

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Contact the factory on special applications or applications exceeding priming or other performance limitations indicated.

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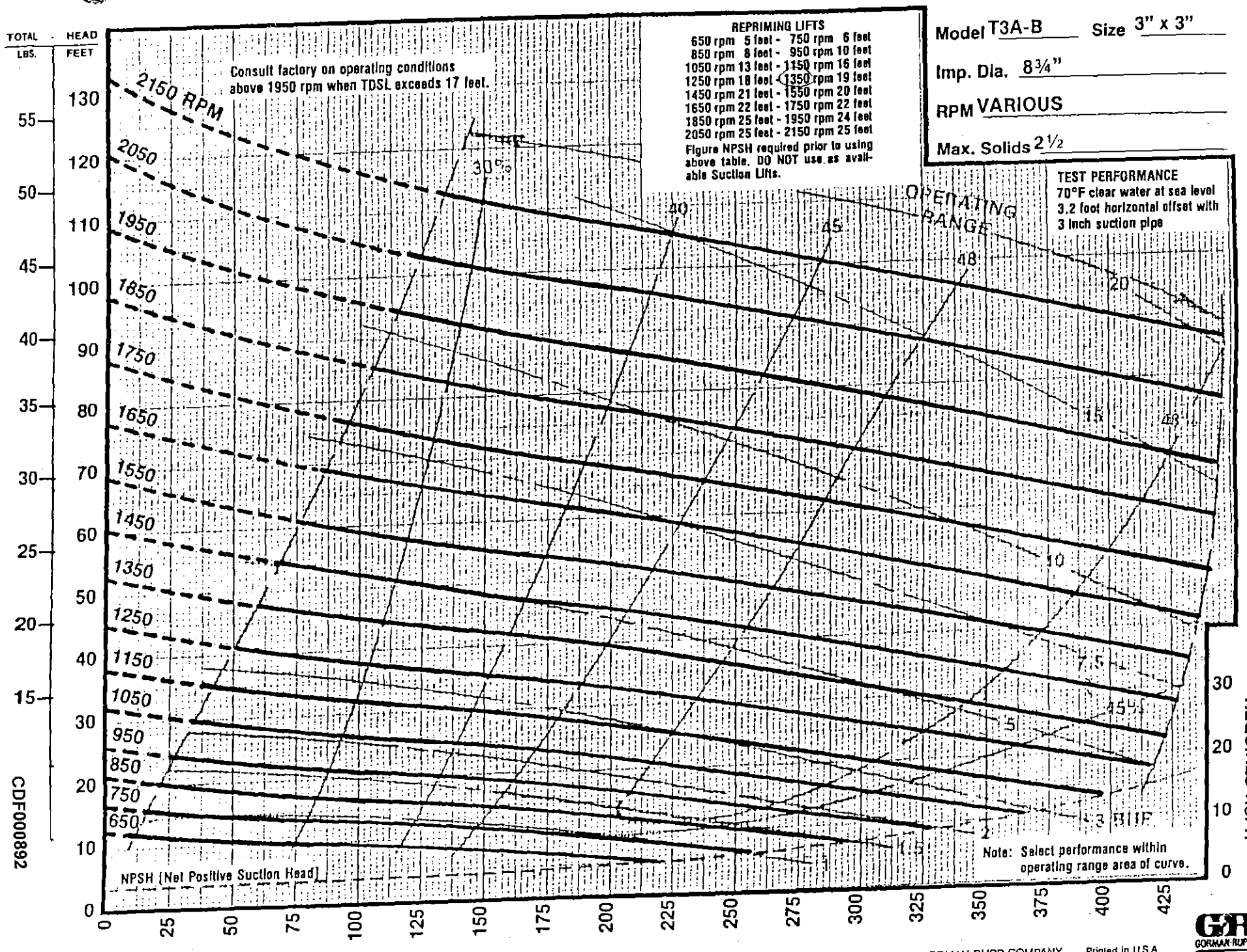

PERFORMANCE CHART NO. T3A-4 2-21-79 SECTION 55 PAGE 1054

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